Human and Climate Changes in the Hudson River Estuary Wetlands

Abstract

The Hudson River has had a great history and serve as an important natural resources-from being the sanctuary for waterfowls, fish, and other wildlife, to purifying water. Thus, the understanding of past environmental change and possible future changes is required. Marshes are great archives of ecosystem and climate changes. In this study, we try to investigate the usage of elemental composition of marsh sediments to refer to the paleoclimate and environmental changes on the estuary. Using certain "elemental markers", we can determine things such as human arrival, land use changes, pollution history, chronology, and climate changes. The study took place at various marshes along the Hudson Estuary, having different vegetation, salinity, and history.

Locations

The red squares show locations where samples have been taken, while the blue shows locations that XRF has been analyzed.

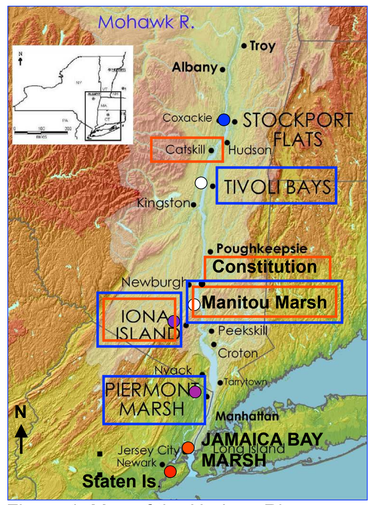
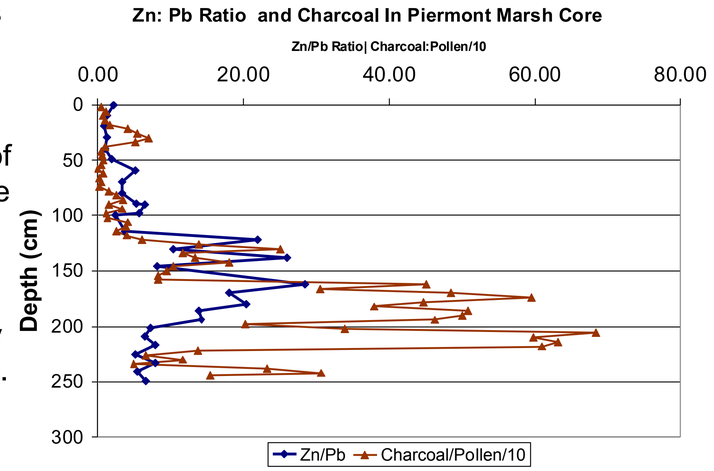


Figure 1: Map of the Hudson River Estuary.

Results: Elemental Analysis as Time/ Environmental Markers

Zn/Pb Ratio as an indicator of drought

The Zn/Pb ratio helps to identify non-anthropogenic sources of Zn increase. The peak of Zn/Pb ratio is near the peak of Charcoal increase during the timing of Medieval Warming indicated by Pederson et al., 2005.



Methods

The Dachnowski Russian corer

-This type of corer takes semi-cylindrical cores. When a good spot is found, the core is driven into the ground, Then the core is rotated which places the sample into the collection chamber, on the underside of the picture below.

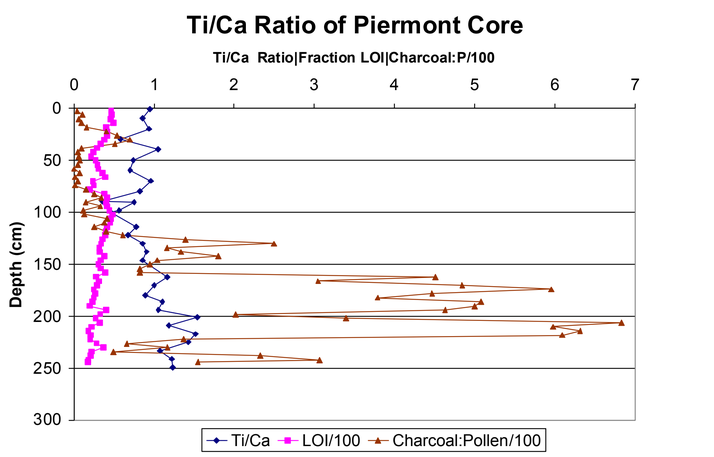
X-Ray Fluorescence Analysis

- XRF Spectroscopy is used to determine the elemental content of core samples

Ti/Ca Ratio as an indicator of sediment source and hydrology:

Order from lowest salinity	Site	0-2 cm Ti/Ca Ratio	Average Ti/Ca in top 30 cm	Standard Deviation
1	Tivoli North Bay	0.6231	0.6672	0.0631
2	Manitou Marsh	0.4780	0.4804	0.0035
3	Iona Island	0.3608	0.6340	0.1634
4	Piermont	0.9560	0.9138	0.0521

Table 1 shows that the Ti/Ca ratio at Piermont, the most brackish site is the highest, showing that salinity alone does not contribute to higher Ti/Ca ratio from marine Ca increase.



Ti/Ca ratio down core at Piermont indicates some trend. The highest value was during the Medieval Warm period where Charcoal count was the highest. It is also inversely correlated with LOI, as Ti influx maybe highly related to inorganic influx into the wetland.

Conclusions

- XRF Spectroscopy result of marsh cores show many promising proxies for climate and anthropogenic changes and requires further investigation.
- Zn/Pb correlates with the timing of droughts and warming periods.
- Ti/Ca requires more investigation to determine a relationship to hydrology and sedimentation changes.

Future Ongoing Research:

- Collect more cores from various sites along the estuary.
-Analyze samples from more locations along the estuary, at more salinity and ecosystem gradient
-Further study the results from samples that have already been analyzed

Thank You!

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